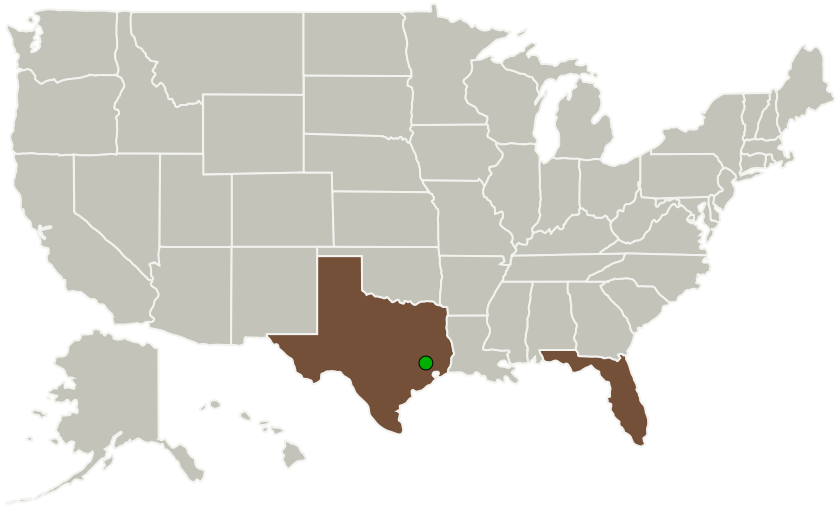
Designer Fluid for use in a Single Loop Variable Heat Rejection Thermal Control System, Phase II

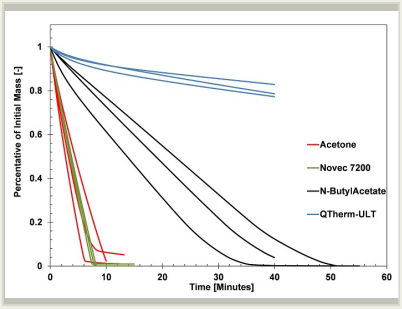
Completed Technology Project (2016 - 2018)

Project Introduction

The efficient thermal control of vehicles is essential to the success of every single NASA mission. All vehicles have very tight requirements for the thermal control systems while simultaneously placing incredibly stringent demands upon them. These demands are getting even more intense given the shift towards variable heat rejection, which is essential in missions reaching beyond the lower earth orbit. Specifically, the thermal control fluid must maintain excellent thermal properties for heat rejection under peak conditions while at the same time remain liquid at extremely low temperatures. Currently used fluids either do not meet the low temperature requirement (glycol/water mixture) or do not have thermal properties conducive to a compact, efficient system (Galden). Mainstream has identified several promising next generation thermal fluids using computation chemical techniques. Mainstream has already demonstrated in Phase I that these fluids are superior to incumbent fluids. In Phase II, Mainstream will perform more long term durability, compatibility and performance studies in a simulated test-loop representative of conditions encountered on NASA spacecraft.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Mainstream Engineering Corporation	Lead Organization	Industry	Rockledge, Florida
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Florida	Texas

Project Transitions

June 2016: Project Start

September 2018: Closed out

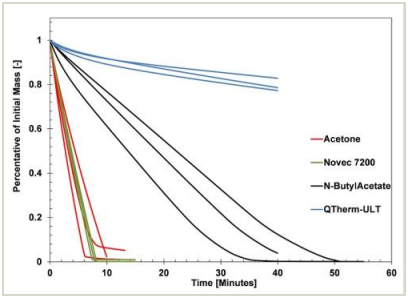
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139643)*

Images

						TURBULENT	LAMINAR	
COMPOUND	BOILING POINT (°C)	FLASH POINT (°C)	FLAMMABILITY RATING	HEALTH RATING	β -90°C/ β 25°C	FIGURE OF MERIT	W_f / W_{Novec}	k_f / k_{Novec}
GALDEN HT 170	170	-	0	1	212	0.4	5.03	0.81
NOVEC 7200	76	-	1	1	12	1	1	1
MEC-1	183	59	2	0	31	0.91	1.95	1.63
MEC-2	172	92	1	1	26	0.92	1.83	1.56

Briefing Chart Image
Designer Fluid for use in a Single Loop Variable Heat Rejection Thermal Control System, Phase II *(https://techport.nasa.gov/image/131310)*



Final Summary Chart Image
Designer Fluid for use in a Single Loop Variable Heat Rejection Thermal Control System, Phase II *(https://techport.nasa.gov/image/133769)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Mainstream Engineering Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

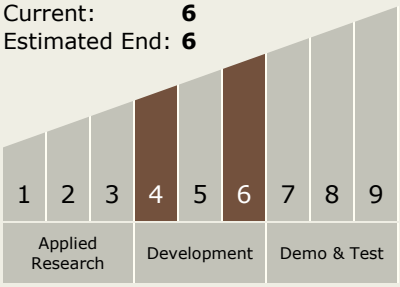
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Ted Amundsen

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Designer Fluid for use in a Single Loop Variable Heat Rejection Thermal Control System, Phase II

Completed Technology Project (2016 - 2018)

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.2 Thermal Control Components and Systems
    - TX14.2.2 Heat Transport

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System